



**Mitja Hinderks**

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Honorable Commissioner of Patents and Trademarks  
Washington DC 20231

Reference the Application of Mitja Hinderks:

Serial No **08 / 477 704**  
Filed June 7 1995  
Group Art Unit 3747  
Examiner N Kamen  
New Title RECIPROCATING ELEMENTS AND ASSOCIATED FLUID FLOWS

December 9 2004

**CERTIFICATE OF MAILING UNDER 37 CFR 1.8**

I hereby certify that the correspondence itemized below is being deposited with the United States Postal Service today on December 9 2004 with sufficient postage as first class mail in a package addressed to:

Assistant Commissioner for Patents  
Washington DC 20231

This package contains the following documents all relating to the above patent application:

- 1 A cover letter dated today, in response to the Office Action mailed June 9 2004;
- 2 A response to the above Office Action;
- 3 An copy of text in this case, as now before the examiner, amended and annotated to show additions and deletions;
- 4 A clean copy of the text, after all additions and deletions;
- 5 An copy of claims in this case, as amended and annotated, edited to comprise all claims including a listing of those deleted;
- 6 A clean copy of claims in this case, after all additions and deletions;
- 7 Two sheets of amended drawings, with changes shown in red;
- 8 Clean copies of the two sheets of drawings, incorporating all changes;
- 9 A credit card debit form, authorizing payment of the three-month extension fee of \$ 510.
- 10 This certificate of mailing

Mitja Victor Hinderks.

Sole inventor, applicant and power-of-attorney of record.



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Sir:

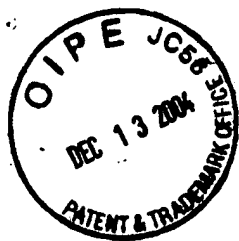
Transmittal herewith is a response to the outstanding action. The enclosed certificate of mailing lists the documents that are part of this response. Petition is hereby made to the Commissioner of Patents and Trademarks to extend the period for response to the Official Action dated June 9 2004 for a period of three months, so as to expire on December 9 2004.

Please debit my credit card the extension fee of \$ 510.00 (small entity), as per the enclosed credit card debit form. In case any additional funds may be needed now or later, please debit my patent office deposit account number **501 334**.

Sincerely,

Mitja Victor Hinderks.

Sole inventor, applicant and power-of-attorney of record.



*rw* *3747*  
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Sir:

#### **RESPONSE TO OFFICE ACTION**

In response to the office action mailed June 9 2003, the period of response being extended three months up to and including December 9 2004 by the attached three-month extension of time petition and fee, applicant submits the following amendments and arguments.

#### **GENERAL:**

In preparing this response, the applicants attests and warrants that no new material has been added. All changes to drawings, text and claims submitted herein are solely for the purposes of clarification or to correct grammatical and other errors.

#### **IN THE DRAWINGS:**

Please add component identification 1328 to Figure 77 on sheet 11, as shown attached in red, and also on the enclosed clean copy of sheet 11.

Please add Figures 281 and 282 on sheet 40, to clarify the disclosure in the second paragraph of page 33 of the text. A clean copy of amended sheet 40 is enclosed.

IN THE TEXT:

Please add the new enclosed Abstract, attached to the end of the text on a separate sheet.

In the amendments listed hereunder, deletions are shown between brackets, additions are shown underlined.

Amend the first paragraph under heading "Clarifications" as follows:

By "uncooled" is meant engines or pumps having (restricted or no cooling, compared to general current production engine practice and includes engines with partial cooling) no mechanism for transfer of heat from combustion or working volume to ambient air. Such mechanism typically comprises a water jacket, pump, radiator and fan, or comprises a fan directing air over metal cooling fins or surfaces. Uncooled engines may have some form of charge cooling, wherein the temperature of the charge is reduced before it enters the combustion or working chamber.

On page 6, after line 24 add new line;

Figures 281 and 282 show splined drive shafts.

On page 11, amend the sentence beginning on line 20 as follows:

Surrounding the engine is a heavily thermally insulated casing 1010, here functioning as structure enclosing volume 1008.

On page 24, amend the six sentences beginning on line 22 as follows:

Figure 77 shows a cross-section of the engine of Figure 75, where high pressure exhaust ports 1321, closable by non-return valves 1322, communicate with high temperature and pressure exhaust reservoir 1323. The piston 1323A when at BDC/TDC unmasks ports 1324, communicating with low temperature and pressure exhaust reservoir 1325. Thermally insulating structure 1328 encloses both volumes 1323 and 1328. Figures 78 to 80 show a cylinder module made up of three elements, plus piston/rod assembly, valves, etc, and incorporating two exhaust processing volumes. The high pressure volume has four shaped snap-in non-return spring loaded valves 1326. Figure 78 is a long section and Figure 79 a cross section through the cylinder, while Figure 80 shows one valve 1326. The modules are assembled via tensile fasteners 1327, which also attach an evacuated thermally insulating cover 1328, separated from structural elements by trapped air space 1329.

On page 25, line 9, insert "there" after 'that'.

On page 33, amend the second paragraph as follows:

For certain applications, including many pumps and / or compressors, rotary motion is not required. It is both simple and obvious to connect the end of the reciprocating piston/rod assembly to a pumping or compressing device. However, in many applications it will be preferred for engine final drive to have exclusively rotary motion, requiring a special link between the final drive and any reciprocating plus rotary movement of the piston/rod assembly (effectively the "crankshaft",

actually the drive shaft). This can be accomplished by a coupling incorporating either a sliding bearing, such as in a splined propeller shaft, or an assembly incorporating roller, ball, needle or taper bearings. By way of example, Figure 281 shows in cross-section and Figure 282 in elevation a schematic of vehicle-type co-axial nested drive shafts capable of reciprocating relative to each other, wherein rotational motion is transmitted via splines 3301 slidably mounted in corresponding grooves 3302. Range of reciprocal motion is indicated at 3303. As another example, Figure 103 shows in cross-section and Figure 104 in elevation a schematic of a coupling between a piston/rod assembly 2078 and a final drive shaft 2079, for applications where loads are transferred in one rotational direction only 2080. Roller bearing races 2081 link planes 2082 inside the piston rod and on the shaft 2083. The connection between the two systems could be anywhere, including inside the piston segment of a piston/rod assembly.

On page 41, amend the paragraph beginning at the bottom of the page as follows:

If one is going to use one combustion chamber module to make engines of varying power and swept volume, then the gas passage(s) within the module (if any) should be so sized as to accommodate the gas flows of the largest engines likely to use that module. Figures 129 to 132 illustrate schematically various possible gas flow layouts, wherein 3126 indicates a multiplicity of equal sized toroidal combustion chambers, 3004 the moving component, 3007 the "fixed" housing (which, in all these embodiments, could also rotate), 3057 an enclosure or casing. A represents charge air volume, B high temperature and pressure exhaust, C lower temperature / pressure exhaust. Filamentary material is shown at 3128a. Porting is not shown, but can be as described elsewhere in this disclosure. Solid arrows describe gas flows through ports, dotted arrows show gas flow to and / or from transfer ports, or flows via passage or plenums as described elsewhere herein. Thermal insulation is indicated (schematically, like all other components) at 3127. In Figure 129, thermal insulation separates charge flow from hot components, charge flows into the combustion chamber, exhaust flows from it into a central exhaust gas reservoir. Obviously, the flows could be reversed, volumes A and B transposed, insulation moved to the interface of component 3004 and the central (now charge) gas reservoir or plenum. Figure 130 shows a system having transfer ports, indicated schematically at 3128. Here again, the flows could be reversed, volumes transposed, insulation repositioned. Figure 131 shows a layout where exhaust gas flows adjacent to the structural component of 3004 and 3007 are used to reduce heat flows (ie thermal gradients) across these components, with the center of the engine occupied by a mechanical system 3130. If 3130 were a fuel delivery system, this could serve to maintain liquid fuel under pressure at temperatures greater than boiling. A compressor and / or turbine system is indicated schematically at 3129 / 3134. In Figures 129, 131 and 132, casing 3057 comprises part of the structure defining volume A, while in Figure 131 thermal insulation 3127 is part of the structure defining volume C.

On page 43, amend the first portion of the paragraph starting there as follows:

Figure 136 shows by way of example an engine assembly whose combustion chambers are of modular construction, wherein details A and B are half vertical sections along the different radii indicated in details C, D and E, which are cross sections through the planes indicated in the vertical sections. Component 3004 reciprocates relative to component 3007 and is shown at bottom

dead center. Details C, D and E are shown with components 3004 and 3007 in different positions relative to each other, when the appropriate detail lines shown on the vertical sections A and B are in approximate alignment with each other. Identical ceramic reciprocating components are shown at 3155, with identical ceramic "housing" components shown at 3156. Charge circulates through volume 3157 and enters combustion chambers 3126 via inlet ports 3158, exits via exhaust ports 3159. Exhaust gas circulates through tubular volume 3160 and is spaced from outer enclosure 3057 by thermal insulation 3127, which functions as structure enclosing volume 3160.

On page 44, line 14, insert "Thermal" before 'insulation';

On page 44, amend the last two paragraphs by adding sentences to each as follows:

In the engine of Figure 138, charge air circulates in tubular volume 3172, enters the combustion chambers via inlet port 3173, exits via exhaust port 3174 into high temperature / pressure exhaust gas circulation volume 3175. The exhaust gas passes to a turbocharger (not shown; the layout of Figure 132 would be suitable), and from there low temperature / pressure exhaust gas passes down the central volume 3176. Components 3155 are separated from each other and the load distributor elements by spacer rings 3177 and spacer plates 3178 having holes to accommodate volume 3175. Components 3156 are separated from each other and the load distributor elements by spacer rings 3179, each having a series of internal projections (see illustrations), and by inlet port rings 3180, each ring having a series of holes permitting the passage of charge air (see illustrations). Here the ring comprises an integral element having an upper rail and a lower rail separated by a series of posts (which accommodate the fasteners 3164), the transitions between them being rounded and smoothed. The tubular charge volume 3172 is enclosed by a casing 3181, here having within it passages 3182 containing circulating liquid, for the purpose of cooling the casing and therefore indirectly the charge. Casing 3181 forms part of the structure enclosing volume 3172.

The engine of Figure 139 has the same combustion chamber components 3155 and 3156 as that of Figure 138, and is therefore presumed to have the same stroke and similar inlet and exhaust port openings, ports shown at 3173 and 3174, respectively. However, the gas flow is different, charge flowing in central volume 3183 to the inlet port via passages 3184 and transfer port 3185, thereafter leaving the combustion chambers via exhaust port 3174 into essentially tubular exhaust processing volume 3175. The difference from the engine of Figure 138 has been achieved only by substituting spacer plate(s) 3178 with a series of eight smaller but taller ring-shaped spacer plate(s) 3186, each also able to accommodate volume 3175, and by substituting the inlet port ring(s) 3180 with taller transfer port ring(s) 3187. Note that spacer elements 3177 and 3179 remain unchanged. Since the gas flows are different, outer casing 3181 can be eliminated. In both engines there are located within or adjacent to components 3156 special volumes 3188 which communicate with volume 3175 and will therefore also contain exhaust gas. As previously, the objective of volumes 3188 is to reduce combustion chamber heat loss through components 3156. Portions of components 3155 and 3186 are part of the structure enclosing volume 3155.

On page 45, amend the first portion of the paragraph starting there as follows:

*The engine of Figure 140 illustrates alternate ways of assembling / fastening / mounting modular combustion chamber components. Components 3189 and 3190 are similar to those illustrated previously, as are volumes 3188 housing or permitting the passage of exhaust gas. Here charge travels within tubular volume 3172 via inlet port 3173 to the combustion chamber; exhaust exits via exhaust port 3174 to central tubular exhaust gas volume 3191. Outer casing 3181 comprises part of the structure enclosing volume 3172.*

*On page 48, amend the first sentence as follows:*

*"Sinusoidal" toroidal chambers may be defined as having opposing surfaces, each of which are not on a straight plane but have a three dimensional form of regular configuration.*

**IN THE CLAIMS:**

*Please **cancel** claims 399, 480 and 551 without prejudice or disclaimer, as they are duplicates of other claims.*

*Please **cancel** claim 546, without prejudice or disclaimer, as it relates to a feature already part of its main claim and is therefore redundant.*

*Please **renumber** claim 552 as 416(a), claim 553 as 497(a) and claim 554 as 535(a). This orders the claim tree by putting all dependent claims below their main claim. If and when a notice of allowance is received, the applicant will immediately re-number the claims in the full claim tree order, starting with claim 1 (eliminating letter subscripts), and will change all cross references accordingly.*

*Please **amend** the following main claims:*

471. (Four times amended) A rotatable shaft, a mechanism and device for the working of fluids in cycles, said device comprising a housing with a cylinder assembly mounted therein, at least one component assembly mounted to reciprocate within said cylinder assembly, said cylinder assembly having at least one working surface and said component assembly having at least one second working surface such that said working surfaces in operation are approximately parallel at least one time each cycle and are co-axial and variably spaced, said surfaces partly defining at least one fluid working chamber varying in capacity during an operating cycle of said device, each of said surfaces being of endless wave-like configuration to permit and limit said component assembly and said second surface to both reciprocate and rotate relative to said cylinder assembly and said first surface, said device including structure which defines a volume substantially surrounding said cylinder assembly, in operation said volume functioning as a passage for fluids worked by said device.

509. (Twice amended) (A) An uncooled device for the working of fluids, said device comprising a housing (with) substantially surrounding a cylinder assembly mounted therein, at least one

*component mounted to reciprocate within said cylinder assembly, said cylinder assembly having at least one working surface and said component having at least one second working surface such that said working surfaces in operation are approximately parallel and co-axial and variably spaced, said surfaces partly defining at least one fluid working chamber varying in capacity during an operating cycle of said device, means deployed between said cylinder assembly and said component to cause said component and said second surface to rotate while reciprocating relative to said cylinder assembly and said first surface, said housing including substantial insulating material for purpose of reducing heat loss from said fluid working chamber.*

Please **amend** the following dependent claims:

*In the amendments to groups of similar claims, the dependent claim number is indicated by XXX. In the two complete lists of claims attached, the correct numbers are inserted. The outline below is only a guide to the examiner; the actual amendments are in the attached two schedules of claims, one annotated, the other clean.*

392, 432,      *A reciprocating internal combustion engine, including (a fuel delivery system, an exhaust*  
473, 511      *emission control system and) the device of claim XXX, said engine having a system for*  
                 *supplying charge and fuel to said working chamber.*

395, 434,      *The compound engine of claim XXX, wherein said second means includes the flow of heated*  
476, 514      *gases in a conduit between said engines.*

417 - 420,      *. . . . .in which work is transferred from said device to said shaft in said mechanism*  
498 - 501,      *(comprises) by . . . . .*  
456 - 459,  
536 - 539

421, 423,      *. . . . .wherein said means comprise a guide restrained by a single endless substantially*  
460, 462      *sinusoidal path, one of each guide and path being on said component assembly, the other on*  
540, 542      *said cylinder assembly.*

429, 430,      *. . . . at least partly penetrates a portion of . . . . .*  
469, 470,  
507, 508,  
549, 550

**REMARKS:**

*Re-examination of this application and reconsideration of the rejection of the claims thereof are*

*respectfully requested under the provisions of Rule 112, for the reasons set forth below.*

***Claim Rejections - 35 USC # 112***

*It is respectfully submitted that with the amendments cited above all antecedents are properly in place.*

- A Language including "structure" has been included in the text.*
- B The various elements in the claims are now functionally linked.*
- C Duplicate and redundant claims have been cancelled.*
- D The fluids are now contained within structure.*
- E Claim 471 has been amended and further limited.*

***Claim Rejections - 35 USC # 103(a)***

*The rejections are all related to claim 509 and its dependent claims, and all the rejections involved the citing of one or two disclosures in combination with Nallinger. (In each rejection, a total of two or three diverse disclosures were cited as "obvious".)*

*During a meeting with the examiner on December 6<sup>th</sup> 2004, the applicant respectfully disagreed that the examiner was right to cite these combinations as obvious, especially as Nallinger's disclosure related to a quite different subject matter, that of sound attenuation or insulation. The present disclosure makes no reference to this, and is concerned with engines and pumps. If relevant, the applicant is happy to provide written argument in support of his views on 103(a).*

*Claim 509 has been amended to further distinguish from Nallinger, and it is believed to be now allowable. If it is allowable then all its dependant claims are presumably allowable too.*

*End of response.*